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ABSTRACT

This paper discusses techniques and resources to use to stimulate creativity through a web site for several "generations" of gifted and talented learners. To organize a web site to stimulate creativity, two categories of development issues must be considered: intrinsic person variables, and process variables such as thinking skills, specific learning processes, and those person characteristics that are responsive to development. Bloom's taxonomy of knowledge contains six levels of skill; the higher-level thinking skills of analysis, synthesis, and evaluation are often integrated into models of creative problem solving. Thinking skills that promote creative solutions to problems are critical thinking, deductive thinking, divergent thinking, inductive thinking, lateral thinking, metacognitive skills, visual thinking, and vertical thinking. Techniques that help establish an environment for creativity are set breaking, warm-ups, blockbusting processes, constructive discontent, creative dramatics, relaxation training, autogenics, psychodrama, sociodrama, and future studies. General systems that develop general creative processes or that value creativity are bionics, synectics, future problem solving, creative problem solving, creativity by design, entrepreneuring, and intrapreneuring. Components of two problem-solving models, methods for creating original associations, creativity enhancing techniques, brainstorming, visualization, and imagery are discussed. Web site addresses that provide examples and references are given throughout the article. A table presents characteristics of creative persons. (TD)

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DEVELOPING A MULTIGENERATIONAL CREATIVITY WEBSITE FOR GIFTED AND TALENTED LEARNERS

Teaching to facilitate creativity, allowing creative growth, or facilitating the natural creative spirit within each learner are phrases that could be used to state the purpose for developing a website for all ages in rural areas. Creativity development is a topic that has received considerable teaching and research attention over the past few decades. Many researchers comfortably assert that creative behaviors are indeed enhanced through creative instruction (seeTorrance, 1987; Treffinger, 1993; Van Gundy, 1987; http://www.creativelearning.com/bibliography.htm)

There is less agreement in the research for the most appropriate type of instruction, the sequence for the instruction, or the essential steps to include in instruction for creative development. Luckily, none of these problems are issues for developing a website as the choices are left to the individual learner. The purpose of this paper is to briefly describe and present several of the creative instructional techniques commonly used to stimulate creativity in Computer Mediated Learning (CML). Specifically, ways of promoting creativity are connected with addresses to use in developing a your website that can be used by several generations of learners (see http://www.profitplay.com/creativity.html or http://planetx.bloom.edu/~pbl/create.htm.

Categories of Development

To organize the website, there are two very broad categories that seem to be the most appropriate for understanding development issues. One of the categories is person variables which is thought to be intrinsic, stable traits, perhaps only modifiable in the long term. For characteristics of the gifted-creative see http://members.aol.com/douglaseby/Page5.html. The person variables are shown in Table 1.

The other broad category of components for creativity development contains process variables, including thinking skills, specific learning processes, and those person characteristics that are responsive to development. For a definition of terms see http://www.buffalostate.edu/~cbir/cbirdefs.htm. Following are descriptors for this category..

Techniques for Development

There are several sources available for investigating the breadth of teaching techniques used to increase creativity with learners living in rural areas. One study used a content analysis of college creativity course syllabi to identify ninety-five various instructional components (Montgomery, Bull & Baloche, 1993). The results represent a vast range of disciplines, including education, business and management, engineering, performing and visual arts, and general studies from all regions of the United States. Starting with this list to build your webste assumes that learners of all ages would benefit from similar techniques.

Creative Thinking Skill Development

Higher Level Thinking: The major advantage to using a common cognitive taxonomy to encourage higher level thinking processes as a component to creative thought is that teachers are usually very familiar with Bloom's taxonomy, see http://mailer.fsu.edu/~jflake/bloom.html . Bloom et al. (1956) originally hypothesized that knowledge could be categorized into stages according to the level of

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complexity and difficulty, from simplest to more complex. The categorization contains six levels of skill: knowledge, comprehension, application, analysis, synthesis, and evaluation. The higher level thinking skills of analysis, synthesis, and evaluation are often integrated into models of creative problem solving, although the descriptive terms may be different. Analysis refers to breaking things down into component parts. Analysis processes are particularly useful in problem defining (http://www2.gasou.edu/geol/2.2SMDP.html), problem finding, or in problem solving (http://www2.hawaii.edu/suremath/home.html) where parts of the problem may have known answers. Synthesis is the bringing together of elements not previously associated to form a unique whole, the essence of creativity. Evaluation, or the valuing of outcome, is the skill to determine or value a potential solution or ideal.

Analysis: The process of analysis is a method of studying the nature or essence of a problem or thing in order to clearly determine its fundamental features or characteristics. In the work of creativity, analysis is used in the problem finding, problem defining, or the preparation stages. See http://devel.ideationtriz.com/inventiv.htm or http://www.stemnet.nf.ca/DeptEd/intermediate/production/04design/04possible/design_con04.htm .

Synthesis: This cognitive skill is the process of putting things, ideas, events together to form a pattern, result, object, or other product unique to the individual. Considered the essence of the creative process, ideas broken down at the analysis level are rearranged to form unique new entities as a complete or whole solution at the synthesis level. The forms of creative association, accommodation, and relations are subsumed under the synthesis process. See http://wwwnhc.nhmccd.edu/public/clh/engl/james/teacher/encourage/encourag.html .

Evaluation: This cognitive skill involves the process of determining the value, appropriateness, or ethics of a given product or process. The resulting product, thought, or process is compared to internal, external, or self generated criteria. Evaluation in creativity deals with all aspects of product/idea development which follow insight or the selection of the solution to be given a trial. Depending on the teaching model this may involve solution optimization, construction, verification, acceptance, funding and sales. See http://www.netins.net/showcase/fwr/blbehior.htm.

Advanced Thinking: Developing thinking skills of various types become necessary but not sufficient conditions for the development of creative solutions to posed and developed problems. Thinking skills to develop to one extent or another include: critical thinking, deductive thinking, divergent thinking, inductive thinking, lateral thinking (CoRT) http://www.edwdebono.aust.com/debono/cort16.htm , metacognitive skills, visual thinking, and vertical thinking.

Critical Thinking: See http://www.vetl.uh.edu/sefh/writing/critic5.html , http://darkwing.uoregon.edu/~tep/library/crit_think.html , http://www.sonoma.edu/CTHINK/K12/k12library/library.nclk , etc. An open minded, logical, non-emotional, questioning, searching, truth conditional, approach to thinking which includes multiple meaning analysis, reasoning, and argument reduction. The focus is on what is probable and what is improbable. The critical thinker looks for valid evidence and reaches sound conclusions. Critical thinking involves skills in observation, inference (inductive and deductive), valuing, clarification and strategies (Heuristic and Stochastic). Check the website http://pcrest.com/cognitive.html for a descripton of the components of critical thinking.

Deductive Thinking: A process in thinking based on inference from an accepted principle, the process of going from the general to the specific. In creativity deductive thinking is useful in new product development and in the development of specific applications of a new idea or product. See links at http://www.waterw.com/~lucia/awlinks.html

Divergent Thinking: The process of thinking in ways which generate problem solutions which are appropriate for a given problem, but which are statistically pure. Typically tests measure statistical rarity, fluency, flexibility and (in Torrance Tests) elaboration. Those who are divergent maintain contact with primary process thinking, according to Dudek and Veneault (1989). Divergent thinking involves affective as well as cognitive skills. Divergent thinking focuses on the qualitative, affective aspects of ideation, the ability to define and find problems and on the ability to evaluate those problems (Runco, 1993). See http://syllabus.syr.edu/FND/MRSTEWAR/2DMANUAL/page5.html or http://irc.mcmaster.ca/irc/papers/wp30.htm

Inductive Thinking: Inductive thinking is the process of forming general principles from specifically observed cases; going from the specific to the general. In creating this means seeing a single event, process, example and generalizing to a whole class of events

Lateral Thinking: (http://einstein.et.tudelft.nl/~arlet/puzzles/) Lateral thinking is purposeful, sequential and designed to be inherently useful in the outcome. Lateral thinking was developed by Edward DeBono and is described in his books, *Lateral Thinking* (1970), *Six Thinking Hats* (1986), and *Serious Creativity* (1992). Specific techniques, such as the use of strategies, filaments or movement are used to create new ideas. See links from the author's page at http://www.ozemail.com/~caveman/Creative/Authors/ABono.htm and at http://www.edwdebono.com/.

Metacognitive Skills: Metacognition is the awareness of thought processes as thinking tasks are performed. It involves using this awareness to control and regulate the process of thought. Success with metacognition includes a commitment to use the process in addition to the knowledge of how to employ the skill. Processes critical to creativity are organizational, hierarchical, relational, and not the rote processes usually taught under metacognition, see http://www3.sympatico.ca/lgrightmire/META.HTM or http://snow.utoronto.ca/Learn2/visnconc.htm .

Vertical Thinking: This process is like digging the source hole deeper. The process of moving back and forth in a hierarchy from lower level to higher level concepts. Vertical thinking is selective and analytical. See http://www.post1.com/home/intuet/stone.htm .

Techniques For Getting Ready

Creating Context: The immediate context is important for the creation of some kinds of small "c" creativity (Csikszentmihalyi, 1997). Techniques thatwill help establish an appropriate environment include: set breaking, warm ups, blockbusting processes (including both psychological and perceptual blockbusting), constructive discontent, creative dramatics, relaxation training, autogenics, psychodrama, sociodrama, and future studies. Each is reviewed in relation to creativity.

Set Breaking: This is the process of getting out of the conventional mode by presenting problems or activities which require the participants to shift their thinking from one strategy to another or to create a new strategy to solve the problem, e.g., the solution shift in the Luchin's water jar problems. Set breakers can be word problems such as wordles e.g., for boxer or other game like activities which cause learners to shift perceptions or solution styles, e.g., Illusions like the Goblet/Two Faces Illusion used in introductory psychology texts. See exercises at http://www.mindbloom.com/techniques.html .

Warm-ups: Warm-ups can be used to begin training sessions on creative processes in which the end product is a list of creative ideas or solutions for a given problem. A variety of activities can be used as warm-ups such as creative dramatic activities, imagination activities, wordles, problem solving set pieces and the like. The activity is designed to have participants view things in new and unique ways and to think about things in different ways or through a different filter. See http://ursus.jun.alaska.edu/archives/grpfac/msg00169.html .

Blockbusting: There are four classes of blocks that reduce or stifle creative production (Interna, External, Environmental, and Problem-Related). Internal Blocks are those related to cognitive or mental skills, (poor imagination); Blocks developed by parents/teachers/ peers (such as, conformity), Blocks related to information acquisition and the development of ideas (e.g., poor study or work habits), Blocks related to motivation, (e.g. lack of persistence); personality blocks to creative thinking and production, Blocks related to emotional insecurity (e.g., fear of making mistakes), and Blocks related to other aspects of personality (e.g. low aspirations) and attitudinal blocks to creative thinking and production (e.g., over-motivated to succeed quickly, no delayed gratification pattern). External blocks relate to teacher rigidity, lack of communicative opportunities, too permissive or authoritarian parents/teachers. Environmental blocks include a coercive, a hostile, competitive or nonsupportive environment. Finally, problem related blocks include lack of preparation, unclear problem definition and so forth, see Simberg (1964). Typically internal blocks are removed through counseling or therapy; external blocks by environmental change. Problem related blocks are reduced by training or creative problem solving. See GNATS (General Natural Actions (Activities or Attitudes) that Threaten and Stop or Stifle Creativity) at http://www.routing.se/av...e.htm#Aunt Polly's Fence, http://www.apa.org/monitor/aug95/limita.html . See book on blockbusting at http://www.ozemail.com/~caveman/Creative/Books/B13159.htm .

Constructive Discontent: Discontent is the beginning of the process of finding ways to improve. If you stub your toe on something, you are likely to move it or pick it up. Constructive discontent is looking for things that might stub your toe, without sacrificing toes. Constructive discontent is not griping; it is proposing ways to make things better. See http://home.okstate.edu/homepages.nsf/toc/isdhome.

Creative Dramatics: Creative Dramatics is an experience where students perform activities to illustrate their perceptions of ways in which an actual or imaginary act or event could take place (Davis, Helfert, and Shapiro, 1973). Experiences such as dancing in Jell-O, growing like a flower, or being part of a machine which makes people are designed to strengthen imagination, physical control, self-confidence, sensory awareness, and so forth. This experience teaches students new experiences of movement, body control, and reduces inhibition leading to more creative output in dance, theatre or in product oriented tasks. Inhibition reduction can improve curiosity, risk taking and so forth. See http://falcon.jmu.edu/schoollibrary/drama.htm .

Relaxation Training: Relaxation is preparing the mind and body to go beyond the tensions of the everyday and to reach for further potentials. The training tries to get participants into an Alpha State (level of brain wave activity) by sequentially suggesting that muscles and body parts are becoming heavy, limp, and relaxed. See Lee & Pulvino (1978) for example activities. Relaxation training is usually used as a precursor for further mental activity such as the Jungian elevator which leads the participant to ask questions in the relaxed state which deal with the problem under investigation. Being relaxed improves contact with the preconscious and subconscious in the same way as does hypnogogic and hynopompic imagery. See http://www.ing.unibo.it/Associazioni/DIMA/RELAXATION.htm .

Autogenics: Autogenics is a biofeedback process that leads the learner to quiet the emotions, the body and breathing process. It is designed to maintain a theta wave form state across the cortex. See Green

and Green (1977). Autogenics in creativity works like relaxation training except it uses a machine to provide feedback. See http://www.autogenic-therapy.org.uk/ or http://www.angelfire.com/ca/hypno97/.

Psychodrama: Psychodrama is a group process designed to get participants to recognize their feelings. We know, for example, that some problem solvers will not use certain classes of decisions because they are seen as personally threatening, e.g., the C.E.O. of a company does not want to know that the best solution for his problem is his own retirement or dismissal. See links at http://www.erols.com/leopold/Psychodrama.htm

Sociodrama: Sociodrama is a group process of role playing which allows members to vicariously experience different alternative situations. The process involves defining the problem, establishing a conflict situation, casting characters, warming up the participants, acting out the situation, cutting the action, discussing and analyzing the results, and further testing or implementation of ideas for new behavior (Dacey, 1989). See http://www.geocities.com/Athens/Acropolis/2060/abstra4-in.htm .

Futuristics/Future Studies: Another technique to establish creative context is the study of the possible/probable alternatives in the future with the idea of solving yet unrecognized problems. Futuristics allows you to prioritize the possible futures so that you can examine many alternatives and determine not only which ones are most likely, but what may need to be done to insure the occurrence (Murdock, 1993). For news groups see http://snow-white.gac.peachnet.edu/learn/newsgroups/future_news.html .

General Creative Systems

There are a number of general systems that purport to develop general creative process, or ones in which creativity is valued or supported. These include: bionics, synectics, future problem solving, creative problem solving, creativity by design, entrepreneuring, and intrapreneuring. Each of these are general systems which have needed steps to produce a creative product. Each of these is described below.

Bionics: Bionics is the search for metaphors and similes in nature to solve problems which are faced by society. For many problems there is an analogous process in nature. Bionics usually proceed through three phases: learning about and describing the biological model, creating a mathematical or logical model from the biological one; and developing the hardware from the mathematical or logical model (The Advanced Technology Staff, 1971). See http://pespmc1.vub.ac.be/ASC/Bionics.html

Synectics: A group process to attack the underlying concept rather than the problem as given is the practice of synectics. By attacking the underlying concept at length, early closure is precluded and radical applications of old techniques may occur (Gordon, 1961). The phases in synectics problem solving are taking the problem as it is presented and making direct, personal, symbolic, and fantasy analogies. Other components include making the strange familiar, interpreting the problem as understood, looking at the operational mechanisms, making the familiar strange, examining psychological states, integrating the psychological states with the problem, developing a viewpoint, and developing a solution or research target. See http://www.ozemail.com/~caveman/Creative/Techniques/synectics.htm for Synectics questions see http://www.ozemail.com/~caveman/Creative/Techniques/syn_quest.htm .

Future Problem Solving: E. Paul Torance designed to Future Problem Solving as a system to give children (grades 4-12) practice in solving hypothetical problems in the future. Problems are provided by a national organization and are submitted for national grading or evaluated locally. See http://www.kaac.com/fpscent.html .

Entrepreneuring: The process of creating new products, markets, values, services, or applications for the market place. This is the process of selling something new that was not previously in existence (Larson, 1993) http://www.theiea.com/ or http://www.town.smiths-falls.on.ca/selfhelp/entre.htm .

Intrapreneuring: Working as an entrepreneur within an organization is a relatively new process developed from the idea of self-directed cost centers which allows those within a business or corporate group to sell their services within and outside of the company to those who need those services. The creative aspects of this process deal with figuring out what you are, to whom you can market yourself (inside and outside the company), and the depth to which you wish to go with the external process. See http://www.imc.org.uk/services/coursewa/bmgt/bm5.htm .

Creative Problem Solving (CPS)
Creative problem solving is a system for finding acceptable solutions to problems. It contains the following process steps: mess finding, data finding, problem finding, idea finding, solution finding, and acceptance finding (Isaksen and Treffinger, 1985). Software for CPS is found at http://www.mindlinker.com:80/cps06.html. Copies of the original *Osborn-Parnes Creative Problem Solving Manual* can be downloaded at http://www.ideastream.com/. http://tile.net/listserv/creacps.html A more detailed model of C.P.S. has been presented by Bull and Montgomery (1990). It includes as trainable components: with two exceptions (openness to the world and insight/illumination), cognitive/affective/skill base, problem finding, problem defining, preparation, idea finding, hypothesis formation, decision-making, symbol review/filter change, elaboration/explication, model building, verification, trademark/patent search, and acceptance finding. This model covers most of the main points in any CPS model (e.g., Wallas, 1926; Parnes, 1972; Davis, 1986 and so forth). For those who would interact with others on CPS there is a listserv which can be contacted at crea-cps-request@nic.surfnet.ni.

Cognitive/Affective/Skill Base: Few people are creative without knowing a lot about the area in which they are creative (Feldhusen, 1993). It is unlikely that you will identify a series of problems in an area in which you are not skilled (Sternberg and Lubart, 1993). A single problem may be identified, but none beyond that. There are a number of general training methods (Mumford, et al., 1993) such as inductive thinking, deductive thinking, critical thinking, abstracting, in conjunction with in-depth reading in a discipline will improve cognitive skill base

Problem Finding: Problem finding is a critical part of creativity according to Einstein and Infeld (1938) who say that "The formation of a problem is often more essential than its solution." (p.92). Learners should be prepared to find and solve problems by setting aside time to read in other disciplines, keeping track of what others are doing that seems original, collecting and filing clippings, notes, and ideas for future reference or keeping a creative notebook of insights, inspirations, and creative ideas to remember ideas. Specific training methods to assist in problem finding include Zwicky boxes (morphological analysis), bisociation, forced relationships, abductive thinking, lateral thinking, attribute listening, homospatial thinking, and Janusian thinking (Bailey, 1979). See http://208.233.92.129/creative.htm , or http://www.delmar.edu/engl/instruct/stomlin/1301int/lessons/content/ruggiero.htm

Problem Defining: Start by stating the problem in a simple, broad, generic way followed by questioning the problem's actual boundaries. Break the problem down into its component parts to see which parts already have solutions. What motives, biases, feelings or prejudices about this problem might interfere with how it is defined. The stage culminates when the problem is specified with the components that

need common and creative solutions and the information that is needed to complete the solution (see preparation). For problem defining techniques see http://www.ais.msstate.edu/AEE/8263/pr_plan/tsld012.htm .

Preparation: Preparing to solve problems involves determining what data is needed and what is known about the problem. Seek out all available sources of information. Look at the key factors to which you do not have solutions in the problem and organize the data around them. Symbolization should be simple, concrete, liked, and should promote interrelation of the senses (this may be helpful in incubation). See http://pcrest.com/cognitive.html presents steps of information processing which look very much like preparation in the creativie process

Idea Finding: Ideas start with individuals, they start in a person's mind. What ideas do we already have? Do an idea dump. Self interrogation can start with Osborn's (1963) list of adapt, modify, magnify, unify, substitute, rearrange, reverse, and combine. Value engineering can be used, see http://akao.larc.nasa.gov/dfc/ve.html.

Hypothesis Formation: A hypothesis is a tentative explanation which can be tried out to see if it works. We speculate what is involved with the problem and design a process to collect data to see if the problem can be resolved. Hypotheses are necessary, in many cases, before solutions can be found or evaluated. See http://www2.gasou.edu/geol/2.2SMDP.html.

Decision Making: Deciding is the process of choosing a solution to a problem. Decisions should not be made under stress, the spur of the moment, without consulting others, without trying to anticipate everything, and without worrying about the consequences. According to Kepner and Tregoe (1979), decision making is improved by setting objectives, classifying them in terms of importance, developing alternatives, evaluating the alternatives against the objectives, choosing the best alternative, assessing possible adverse sequence and controlling the effect of the final decision. According to Van Denmark (1991) good decision makers anticipate problems, avoid indecision, and prioritize their problems. See force field analysis at http://www.gasou.edu/psychweb/mtsite/forcefld.html.

Symbol Review and Filter Change: To speed up the incubation process, we create symbols which help the unconscious focus on the problem at hand. These symbols should be simple, concrete, liked, in an area of strength, and should promote the interrelationship of the senses. Symbols should appeal to the emotions and to other senses than just sight. The use of symbolization enhances the specification of the problem (Nowak-Fabrykowski, 1992).

Verification: Verification is important in the process of creative idea/product development when the solution or product is tested against the requirements of the problem. The critical questions are "Does it do what it was supposed to do?" "Does it meet the standards set by those who want the product?" Verification comes before acceptance finding and it is for the developer a necessary condition for going on with the new product development, see Bailey, 1979.

Trademark/Patent Search: Typically a process in new product development where the inventor must prove that the idea is new and has not been taken directly from the work of another, Bailey (1979). This is part of the acceptance finding and verification process which must be done for all new products before they are test marketed. See http://www.patents.ibm.com/

Acceptance Finding: This stage of the model includes the discovery of who or why the solution might be used. If we want to implement the solution what are the actions that must occur? Who needs to be

convinced? This may include customers (users), management (administration), regulators, and so forth. Examine the politics of the situation and determine what resistances need to be overcome. Develop a strategy for convincing others and begin to implement.

Another Problem Solving Model: Another problems solving model is presented at http://pcrest.com/cognitive.html. This model is very similar to CPS and the Bull and Montgomery Model and includes validating, documenting, understanding context, ensuring solution robustness and generalizing problem solutions.

Creating Original Associations

There are a number of methods for creating new and original associations, including: analogy/metaphor, bisociation, forced relationships, homospatial thinking, Janusian thinking, living the paradox, metaphorical thinking, similes, and transformations. Each of these is presented as related to the development of creativity.

Analogy and Metaphor: Analogy is drawing on the common likenesses of two or more things to infer other common characteristics (see Middleton, 1991). Metaphor is the suggestion of a resemblance between things which is not literally applicable (see Grossman & Wiseman, 1992). Metaphor and analogy are used to develop relationships which are not intuitively obvious. See http://www.ozemail.com/~caveman/Creative/Techniques/forced_analogy.htm .

Bisociation: Bringing together two dissimilar planes of knowledge or disciplines so that new associations are generated is the process of bisociation. New connections where none existed previously (Koesteller, 1964). See http://www.newciv.org/worldtrans/ncn/creativity.html.

Forced Relationships: Relationships can be forced by mechanical methods with a prescribed structure where random words or ideas are associated. Related words from two or more disciplines placed in a separate bowls or hats are drawn. The pair or triad must be associated to work on a specific problem. Another way is to find relationships between any known elements. See http://www.ozemail.com/~caveman/Creative/Techniques/forced_analogy.htm.

Homospatial Thinking: This process is actively conceiving two or more discrete entities occupying the same space, a conception leading to the articulation of new identities. This concept developed by Routhenberg (1979) relates initially to visual approaches to creativity. Based on his therapeutic work with artists with productive blocks this approach provides new insight in the visual metaphor. See http://www.coe.drexel.edu/CAE/AED2_954/CrProbSv.html .

Janusian Thinking: This process was initially described by Ari Routhenberg (1979) from his work with artists who had developed blocks in production. He worked therapeutically with a number of visual artists who described using the process when they were trying to create new visual metaphors. See http://www.compapp.dcu.ie/~tonyv/MIND/antonio.html
http://www.delmar.edu/engl/instruct/stomlin/1301int/lessons/content/ruggiero.htm.

Metaphorical Thinking: This process is taking ideas from one context and applying them in a new situation. See http://www.ozemail.com/~caveman/Creative/Techniques/metaphor.htm .

Transformations: Feldman (1994) describes a universal tendency in humankind to produce new things, which is called "the transformational imperative." Piaget describes this process as reflective (or reflexive) abstraction. Creativity comes therefore as a result of transformation in one form or another.

Creativity Enhancing Techniques
For a list of creativity enhancing techniques see http://www.missouri.edu/~jourcw/creativ.html. Techniques included are asking questions, imagery, Scamper, dealing with creativity blocks and creativity enhancers. See online tools at http://www.q-net.net.au/~gihan/mindgames/tools.html..

Brainstorming: A group process (N = 5-10) under the direction of a skilled leader to generate ideas to solve a clearly posed problem in which there is no criticism, freewheeling is welcome, quantity of ideas are desired, and piggybacking is desired. See http://www.ozemail.com/~caveman/Creative/Techniques/brainstorm.htm For Axon's 70 checklists for creative problem solving, see http://web.singnet.com.sg/~axon2000/news.htm, see links http://haas.berkeley.edu/~marquis/creativity.html,. Another brainstorming program is found at http://www.tarkvara.org/interloq/quicktut.html.

Attribute listing: Attribute listing is the process of inventing something that is similar to an existing object by modifying its attributes (Davis, 1986). This is done by listing the major (and sometimes the minor) attributes of an object and then providing many examples of these attributes. See http://www.ozemail.com/~caveman/Creative/Techniques/attributes.htm .

Checklisting: A checklist is a series of checks, tests or considerations which are performed to insure that all relevant aspects of a problem are examined and that nothing of importance is overlooked. Polya's procedures, Osborn's lists, Bug lists (things that bug you) and others are examples of checklists (see Davis, 1986 are useful in helping defer judgment. See http://www.ozemail.com/~caveman/Creative/Techniques/checklists.htm .

Morphological analysis: Morphological analysis is an extension of attribute modifying in which specific ideas for each attribute are listed on each axis of an N-dimensional array such that all interactions are possible. It uses a two or three dimensional matrix to examine new relationships between variables, attributes, characteristics, etc. The objective is to rapidly generalize a new set of associations so that they can be used as triggers for further analysis and problem solving. See http://www.ozemail.com/~caveman/Creative/Techniques/morph.htm .

Visualization: Visualization is a process to use imagination to create a model or internal representation which shows how a thing, product,or event might look when completed. Visualization is different from imagery which recreates that which already exists and from fantasy which produces images that are unlikely to be replicable in real world media. See example at http://members.aol.com/omegagbg/1part1.htm .

Imagery: Imagery is the process of being able to recreate a picture or image of an existing object in one's imagination. This process is an essential but not sufficient condition for visualization. See http://web.singnet.com.sg/~axon200/brochure.htm for an idea visualization tool, http://haas.berkeley.edu/~marquis/creativity.html, or http://www.imagerynet.com/atlantis/ .

Guided Imagery: This is the process of encouraging imagery process and then guiding the images for heightened experience or insight. See audio tapes at http://www.touchstarpro.com/sommerville-tapes.html or http://www.cp.duluth.mn.us/~books/wpa/tr/gig/gig.htm .

Table 1

Characteristics of Creative Persons

Intuition	Internal/external openness	Internal/external sensation seeking	Preference for cognitive complexity	Novelty seeking
Inquisitiveness/ Curiosity	Reflectiveness	Introspection	Independence	Skepticism
Tolerance for ambiguity	High energy level	Enthusiasm	Single-minded goal seeking	Stimulated by frustration
Regression in the service of the ego	Internal locus of control	Self-confidence	Motivation to achieve	Aesthetic sensitivity
Insight	Innovation	Bisociation	Divergent thinking	Critical thinking
Metaphorical thinking	Honospatyial thinking	Janusian thinking	Humor	Visual thinking
Inductive thinking	Deductive thinking	Inventing	Lateral thinking (C0RT)	Vertical thinking
Visualization	Imagination	Imagery	Fantasy	Idea finding
Metacognitive skills	Idea finding	Preparation	Problem finding	Cognitive/affective/ skill base
Problem defining	Hypothesis formation	Incubation	Illumination/ insight	Elaboration/ explication
Acceptance finding	Verification	Model building	Trademark/ patent search	Entreprenuring
Intraprenuring	Constructive discontent	Conceptual blockbusting	Autogenics	Similes
Critical incident process	Recentering	Morphological analysis	Futurfict	Creative dramatics
Expressive activities	Sociodrama	Psychodrama	Relaxqation	Living the paradox
Bionics	Checklisting	Future problem solving	Creative problem solving	Brainstorming
Analogy/ metaphor	Synectics	Future studies	Set breaking	Attribute listing
Warm up	Creativity by design	Forced relationships	Transformations	Guided design
Guided imagery	Tagmenics	Analysis (Bloom's)	Synthesis (Bloom's)	Evaluation (Bloom's)
Diacrony vs synchrony	Decision making	Altered states of consciousness	Symbol review/ filter change	Self-actualization